

NCERT Solutions for Class 10 Maths Chapter 12 Exercise 12.4: Chapter 12 of Class 10 Maths, *Surface Areas and Volumes*, introduces practical applications of 3D geometry. Exercise 12.4 focuses on solving problems related to the conversion of solid shapes and their volumes.

Students learn to calculate the surface areas and volumes of combined or reshaped solids, such as spheres, hemispheres, cones, and cylinders. The exercise strengthens the understanding of real-life applications by teaching methods to calculate material usage, wastage, or reformation during transformations. It provides a step-by-step approach to applying formulas and encourages problem-solving skills by handling complex shapes, ensuring clarity in understanding geometry concepts for exams and beyond.

NCERT Solutions for Class 10 Maths Chapter 12 Exercise 12.4 Overview

The NCERT Solutions for Class 10 Maths Chapter 12 Exercise 12.4 is an essential resource for mastering the topic of Surface Areas and Volumes. This exercise focuses on solving problems involving the conversion, combination, and transformation of 3D shapes like spheres, cones, and cylinders.

This provides step-by-step solutions, helping students understand the application of formulas and develop problem-solving skills. It is especially useful for self-study and revision, offering clarity on complex problems and boosting confidence for exams. With accurate solutions and clear explanations, this resource ensures students build a strong foundation in geometry for future academic success.

NCERT Solutions for Class 10 Maths Chapter 12 Exercise 12.4 Surface Areas and Volumes

Below is the NCERT Solutions for Class 10 Maths Chapter 12 Exercise 12.4 Surface Areas and Volumes -

1. A drinking glass is in the shape of a frustum of a cone of height 14 cm. The diameters of its two circular ends are 4 cm and 2 cm. Find the capacity of the glass.

Solution:

Radius (r_1) of the upper base = $4/2 = 2$ cm

Radius (r_2) of lower the base = $2/2 = 1$ cm

Height = 14 cm

Now, the capacity of glass = Volume of the frustum of the cone

So, Capacity of glass = $(\frac{1}{3}) \times \pi \times h(r_1^2 + r_2^2 + r_1 r_2)$

$$= (\frac{1}{3}) \times \pi \times (14)(2^2 + 1^2 + (2)(1))$$

$$\therefore \text{The capacity of the glass} = 102 \times (\frac{2}{3}) \text{ cm}^3$$

2. The slant height of a frustum of a cone is 4 cm, and the perimeters (circumference) of its circular ends are 18 cm and 6 cm. Find the surface area of the frustum.

Solution:

Given,

Slant height (l) = 4 cm

Circumference of upper circular end of the frustum = 18 cm

$$\therefore 2\pi r_1 = 18$$

$$\text{Or, } r_1 = 9/\pi$$

Similarly, the circumference of the lower end of the frustum = 6 cm

$$\therefore 2\pi r_2 = 6$$

$$\text{Or, } r_2 = 3/\pi$$

Now, the surface area of the frustum = $\pi(r_1 + r_2) \times l$

$$= \pi(9/\pi + 3/\pi) \times 4$$

$$= 12 \times 4 = 48 \text{ cm}^2$$

3. A fez, the cap used by the Turks, is shaped like the frustum of a cone (see Fig.). If its radius on the open side is 10 cm, the radius at the upper base is 4 cm, and its slant height is 15 cm, find the area of material used for making it.



Fig. 13.24

Solution:

Given,

For the lower circular end, radius (r_1) = 10 cm

For the upper circular end, radius (r_2) = 4 cm

Slant height (l) of frustum = 15 cm

Now,

The area of material to be used for making the fez = CSA of frustum + Area of the upper circular end

$$\text{CSA of frustum} = \pi(r_1 + r_2) \times l$$

$$= 210\pi$$

$$\text{And, the Area of the upper circular end} = \pi r_2^2$$

$$= 16\pi$$

$$\text{The area of material to be used for making the fez} = 210\pi + 16\pi = (226 \times 22)/7 = 710 \frac{2}{7}$$

$$\therefore \text{The area of material used} = 710 \frac{2}{7} \text{ cm}^2$$

4. A container, opened from the top and made up of a metal sheet, is in the form of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm, respectively. Find the cost of the milk which can completely fill the container at the rate of Rs. 20 per litre. Also, find the cost of the metal sheet used to make the container if it costs Rs. 8 per 100 cm².

Solution:

Given,

$$r_1 = 20 \text{ cm},$$

$$r_2 = 8 \text{ cm and}$$

$$h = 16 \text{ cm}$$

$$\therefore \text{Volume of the frustum} = \left(\frac{1}{3}\right) \times \pi \times h (r_1^2 + r_2^2 + r_1 r_2)$$

$$= \frac{1}{3} \times 3.14 \times 16 ((20)^2 + (8)^2 + (20)(8))$$

$$= \frac{1}{3} \times 3.14 \times 16 (400 + 64 + 160) = 10449.92 \text{ cm}^3 = 10.45 \text{ lit}$$

It is given that the rate of milk = Rs. 20/litre

So, the cost of milk = $20 \times \text{volume of the frustum}$

$$= 20 \times 10.45$$

$$= \text{Rs. } 209$$

Now, the slant height will be

$$l = \sqrt{h^2 + (r_1 - r_2)^2} = \sqrt{16^2 + (20 - 8)^2} = \sqrt{16^2 + 12^2}$$

$$l = 20 \text{ cm}$$

So, CSA of the container = $\pi(r_1 + r_2) \times l$

$$= \frac{314}{100} (20 + 8) \times 20 \text{ cm}^2$$

$$= 1758.4 \text{ cm}^2$$

Hence, the total metal that would be required to make the container will be = $1758.4 + (\text{Area of the bottom circle})$

$$= 1758.4 + \pi r^2 = 1758.4 + \pi (8)^2$$

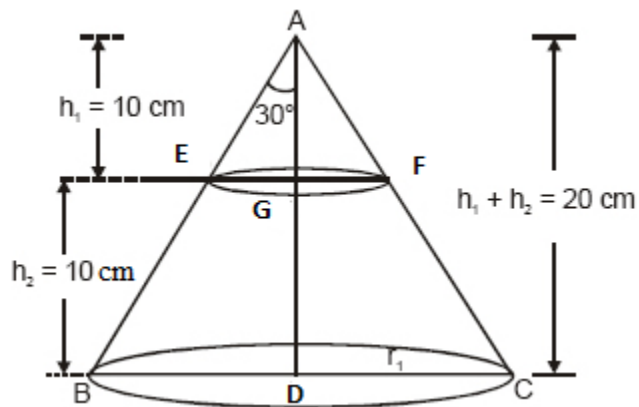
$$= 1758.4 + 201 = 1959.4 \text{ cm}^2$$

$$\therefore \text{Total cost of metal} = \text{Rs. } (8/100) \times 1959.4 = \text{Rs. } 157$$

5. A metallic right circular cone 20 cm high and whose vertical angle is 60° is cut into two parts at the middle of its height by a plane parallel to its base. If the frustum so obtained is drawn into a wire of diameter $1/16$ cm, find the length of the wire.

Solution:

The diagram will be as follows



Consider AEG

$$\frac{EG}{AG} = \tan 30^\circ$$

$$EG = \frac{10}{\sqrt{3}} \text{ cm} = \frac{10\sqrt{3}}{3}$$

In $\triangle ABD$,

$$\frac{BD}{AD} = \tan 30^\circ$$

$$BD = \frac{20}{\sqrt{3}} = \frac{20\sqrt{3}}{3} \text{ cm}$$

Radius (r_1) of upper end of frustum = $(10\sqrt{3})/3$ cm

Radius (r_2) of lower end of container = $(20\sqrt{3})/3$ cm

Height (r_3) of container = 10 cm

Now,

Volume of the frustum = $(\frac{1}{3}) \times \pi \times h(r_1^2 + r_2^2 + r_1 r_2)$

$$= \frac{1}{3} \times \pi \times 10 \left[\left(\frac{10\sqrt{3}}{3} \right)^2 + \left(\frac{20\sqrt{3}}{3} \right)^2 + \frac{(10\sqrt{3})(20\sqrt{3})}{3 \times 3} \right]$$

Solving this, we get

Volume of the frustum = $22000/9 \text{ cm}^3$

The radius (r) of wire = $(1/16) \times (1/2) = 1/32 \text{ cm}$

Now,

Let the length of the wire be "l".

The volume of wire = Area of cross-section x Length

$$= (\pi r^2) \times l$$

$$= \pi (1/32)^2 \times l$$

Now, Volume of frustum = Volume of wire

$$22000/9 = (22/7) \times (1/32)^2 \times l$$

Solving this, we get,

$$l = 7964.44 \text{ m}$$

Benefits of Using NCERT Solutions for Class 10 Maths Chapter 12 Exercise 12.4

Clear Conceptual Understanding: Step-by-step solutions simplify complex problems, enhancing understanding of surface areas and volumes.

Exam Preparation: Provides accurate answers aligned with exam patterns, boosting confidence and performance.

Time Management: Helps in solving problems efficiently by applying the right formulas and techniques.

Self-Study Support: Ideal for independent learning and revision, offering clarity on difficult concepts.

Real-Life Applications: Improves problem-solving skills by relating geometry to practical scenarios involving solid shapes.

Error-Free Solutions: Ensures correct and reliable answers to strengthen your foundation in geometry.